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ABSTRACT

Multicultural study, visual and language arts, social studies, and geometry are integrated into this 2-month unit for the elementary classroom. The unit is divided into 3 segments, centering around the creation of a class icosahedron in which each of the shape's 20 faces represents 1 class member. Actual construction of the icosahedron constitutes the first segment of the unit. For this assignment, each student is required to bring pictures or personal items from home and arrange these on a triangle which will be his contribution to the icosahedron. The second segment contains a set of follow-up activities designed to analyze information collected in the icosahedron. Some of the activities recommended are discussion of student-teacher and student-class relationships and an examination of the role of the individual in the community. The final segment of this unit is a supplemental project in which students write self-portraits and biographies. For each segment, materials, detailed directions, relevant discussion topics, and suggested readings are outlined. Methods for evaluating the unit, such as student-teacher conferences and end unit games are recommended. An appendix offers a sample letter to parents explaining the unit. (LP)

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OUR CLASS AS AN ICOSAHEDRAL COMMUNITY

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Multicultural study, visual arts, language arts and geometry are all integrated into this unit. The objectives reflect this integration.

OBJECTIVES:

1. To demonstrate concretely how one community (a class of students and teachers) is more complex than the sum of its member individuals and how every member is a unique and essential part of the working whole.
2. To invite each student to express his/her individuality in a visual art form, written work and oral communication.
3. To encourage students to find and discuss their own areas of expertise and the areas of expertise of others.
4. To develop skills of interviewing.
5. To encourage each child to produce a written self-portrait (autobiography) and a biography.
6. To invite students to read biographies and autobiographies of other experts.
7. To provide students with experience in making two and three-dimensional objects.
8. To introduce vocabulary and concepts of geometry.

This unit is sure to send parents scurrying for the dictionary. What is an icosahedron?

An icosahedron is "a body with twenty sides, a solid with twenty plane surfaces."[1] A regular icosahedron is a "regular solid having twenty equilateral triangles for its faces."[2] According to the Oxford English Dictionary, the first written reference to the icosahedron was written in 1570 and is as follows. "The opposite sides of an Icosahedron are parallels."[3] A reference written a century later states, "There are five regular Bodies: The Cube, the Tetraedrum, the Octaedrum, the Dodecaedrum, and the Eicosaedrum."[4] In 1881 Routledge wrote, "To each element Plato assigns a geometrical solid: to earth, the cube; to fire, the pyramid; to air, the octaedrum; to water, the icosahedron."[5]

In this unit students make an all-class icosahedron. Each

of the twenty faces will be made by and will represent one child or teacher. If the class does not consist of exactly twenty members, faces for school principal, teachers, teacher's aids, etc. can be included to bring the count to twenty. Or, the face shape can be changed so that a three-dimensional object which has the requisite number of faces is formed. Twelve regular pentagons can create a dodecahedron. (For an entertaining definition of a dodecahedron, one may read "The Dodecahedron Leads the Way", Chapter 14 of Norton Juster's The Phantom Tollbooth.[6]) Four equilateral triangles can create a pyramid. Six squares can create a cube.

To begin this unit a letter is to be sent home to parents introducing the unit and asking for three to seven photographs or other two-dimensional items of personal interest to the student to be used in a multicultural art project. The Appendix is such a letter. It provides concise requirements for the needed items. The teacher may also choose to take and develop photos of each child to ensure that each child will have a current photo.

When students have gathered their photographs and other two-dimensional items the project can begin. Students are first invited to discuss their items with friends and teacher. Then each child is provided with a circle of medium-weight oaktag. Twenty such circles are to be precut by the teacher. Each circle measures $7\frac{1}{2}$" in radius. On each circle the teacher has drawn an equilateral triangle so that all three corners of the triangle touch the arc of the circle. (To trace and cut these circles, a master circle can be made by tying a $7\frac{1}{2}$" length of string to

a pencil and affixing the other end of the string with tape to the middle of a piece of oaktag which is at least 15 by 15 inches wide. Then, holding the pencil perpendicular to the paper and keeping the string taut, the teacher can draw a circle. Once this has been done, the string can be untaped, the circle cut and 20 more circles drawn and cut, using the master as a tracing guide.)

Given a wide choice of two and three-dimensional objects to handle and trace, each child will select objects that can be traced within the equilateral triangle on his/her triangle. Shapes are to be chosen according to how well these shapes work as frames for the child's two dimensional objects. The child will arrange the shapes in his/her triangle and will trace the shapes with a pencil onto the oaktag triangle-inscribed-in-a-circle. With the teacher's help the child will cut out these shapes with an exacto knife. Once the shapes are cut out, the child will tape his/her selected two-dimensional personal items onto the back of the circle so that the items are framed in the shape holes, and do not extend beyond the perimeter of the equilateral triangle drawn on the other side of the circle. Next, the child will fold the circle on the lines that form the sides of the triangle so that the folded flaps cover the front faces of the framed two-dimensional items.

The child is asked to write his/her name on each flap. On a separate sheet of paper s/he is encouraged to write at least three statements that describe what makes her/him unique. These statements are shared with the teacher so that they may be translated into adult spelling and grammar so the child can write

these statements correctly onto the flaps of her/his circle. The statements may or may not relate to the child's framed two-dimensional personal items.

At these designing stages each child may choose to embellish her/his piece with paint, collage, pencil, chalk or any other art media. The geometric-frame media is not meant to be rigid, but is meant to encourage further experience with geometric shapes.

When every child is finished with his/her piece the teacher asks the students to stack their projects and bring them to a general meeting area. The teacher, asking students for definitions of community and individualism, begins to staple pieces together at the flaps so that at the side flap of any triangle, one side flap of another triangle is stapled to it. Flaps face out. The flaps of all twenty equilateral triangles are stapled and an icosahedron is soon formed.

When the icosahedron is assembled several activities can be employed. A list of information on class members can be compiled from the icosahedron and students can be asked to identify which bit of information distinguishes which child. The relationships between students and students, students and teachers can be discussed. The relationship between the individual faces of the icosahedron and how each face supports the others can be discussed. This can be related to the issue of individuals and community to to show that community is more than the addition of individuals. The icosahedron can be discussed in relation to how may faces it has and whether or not it will be whole, hold up and still be the same shape if any one or more of these faces is missing. What

happens in a community when a member leaves it can be discussed. Students can take turns discussing their faces of the icosahedron -- why they chose the items they did, what the photos and items are of, why the child chose to use the statements s/he did, etc.

When several of these activity possibilities have been tried, the icosahedron can be hung from the ceiling of the classroom where it can be referred to by students, parents and teachers. The icosahedron should be suspended at child level so that all faces can be easily seen by the children.

To further develop geometric concepts which are inherent to this unit, the teacher may wish to use supplementary materials and activities. Children may be provided with modeler's clay and 8¼" and 4 1/8 " long straws with which to build geometric shapes and solids. For more permanent structures, a set called Orbit Material for Mathematics may be used. This set is distributed by Selective Educational Equipment, Inc. 3 Bridge St., Newton, MA 02195 (617) 969-3330. This set substitutes flexible and non-flexible reusable bits of zero to twelve prongs for the clay globs used above. The constructions made with this set are more durable than those made with clay and the inflexible bits form constructions of curves while the flexible bits form constructions of straight lines.

When a child builds a shape, solid or other construction, s/he is invited to discuss and describe it with the teacher. In these discussions the teacher can find out what the child already

knows about two and three-dimensional objects and the teacher can introduce one new geometric concept. Concepts of angles, parallel lines, perpendicularity, curves, special solids or shapes -- icosahedron, tetrahedron, rhomboids, squares, rectangles, dodecahedron, etc. -- open and closed space, etc. can be introduced through pointing out and discussing characteristics of child-made constructions.

Once a student has discussed his/her constructions, the teacher may ask him/her to draw the construction on a piece of paper. This invites the child to convert a three-dimensional object into a two-dimensional representation. This is not easy. A child can be helped in this if after the child has made a first attempt, the teacher asks the child to write down how many straws and bits the three-dimensional object has and to compare this with how many straws and bits appear in the two-dimensional representation.

When the child has drawn a two-dimensional representation which suffices for him/her, the child may be encouraged to draw the object from another angle. Thus, introducing perspective.

As another variation on this theme, children may be asked to create a three-dimensional object from a two-dimensional representation. The Orbit Material for Mathematics set provides some challenging two-dimensional representations to be made into three dimension with straws and bits. A child may also choose to experiment with the drawings made by other students in the preceding project. And blueprints and diagrams of projects to

be made with wood, paper, or other media might also be brought into the classroom along with the materials needed to construct replicas of the three-dimensional structures represented in the two-dimensional diagrams. Bird feeder designs and origami are two considerations.

To further develop the students' ability to express themselves and recognize their individual areas of expertise two projects can be carried out. A bulletin board called Experts have Expertise can be developed and a unit in writing self-portraits may be explored.

To preface the unit on self-portraits, the teacher may explain what a self-portrait is and the teacher may read Margot Zemach's Hush, Little Baby (New York: E. P. Dutton, 1976) and Self-Portrait: Margot Zemach, written and illustrated by Margot Zemach (Reading, MA: Addison-Wesley, 1978). After reading these books the teacher may pretend to be Margot Zemach and have the students ask questions of the teacher as though the students were actually interviewing Margot Zemach. The teacher may respond with answers that approximate those that might actually be given by Margot Zemach. Margot Zemach's expertise as an author and illustrator is to be addressed.

Next, the students may be paired and asked to interview their partner. They may write both questions and answers. They are encouraged to help discover specific information relating to their partner's area or areas of expertise. After

approximately ten minutes these interviews may end and students can be given booklets in which to begin writing their self-portraits. The information gathered in the partner interview may or may not be included in the piece according to the individual student's judgement.

The self-portraits may be worked on for a half hour or more a day. When students choose to, they may read their pieces to the class, teacher or a chosen group of friends. The child may ask for comments, questions and/or suggestions and for specific help in discovering whether there is information missing or whether the self-portrait is near completion.

It is hoped that every child will complete a self-portrait. To encourage their endeavor, the teacher may wish to read (or have available for students to read) books on children who are experts and their areas of expertise. Some very fine biographies of children written in first person are Jill Krementz's books: A Very Young Gymnast (New York: Alfred A. Knopf, 1978), A Very Young Skater (New York: Alfred A. Knopf, 1979), A Very Young Rider (1977), A Very Young Dancer, and A Very Young Circus Flyer (1977). These books give specific information and photographs about children and how they became experts and further developed their expertise. Another fine series by Crowell-Collier Press describes in third person the daily lives of children in other cultures. Japan: A Week in Daisuki's World by Martha Sternberg (New York: Crowell-Collier Press, 1973) is just one of this fifteen-book series.

Biographies which have been written for children about adult experts are also useful in that they often discuss how the expert became involved in his/her field of expertise at a very young age. To ensure that biographies of black experts are not overlooked, Garrard Publishing Company offers a fine series titled Americans All which includes books on Mahalia Jackson, Jake Gaither and Harriet Tubman.

The availability of published biographies in the classroom can provide students with examples of what information may be included in their biographies. It also encourages students to read about experts in many fields and assists students in finding their own areas of expertise.

The Experts Have Expertise bulletin board begins with a group discussion in which each child is asked to think of at least one area s/he is an expert in. Students may be invited to share their thoughts. Then, students are given first draft paper on which to write their name and areas of expertise. As a child completes this s/he conferences with the teacher to share what s/he has written and to acquire the standard spelling and grammar. The child is given a three by 18 inch piece of colored oaktag. The child transcribes her/his list of areas of expertise in standard spelling and grammar onto the oaktag and then may post her/his piece on a bulletin board. Students may make and post the lettering for the title of the bulletin board, as well.

Once students have focused on their own areas of expertise and have written a self-portrait, they are encouraged to consider

the expertise of others. One student is focused on each week as the Author/Illustrator of the Week. Throughout the week students and teacher interview the child about his/her expertise in writing and in other areas.

Then students are asked to interview a family member or friend about his/her area of expertise. (Parents can be alerted of this homework assignment in advance. But, the responsibility for the assignment must be left with the child.) Students are encouraged to take notes during the interview. These notes may prove useful in developing a biography based on the expertise of the individual who is interviewed.

Each child is encouraged to write at least one biography. Biographies can be shared and conferenced over at any stage in the writing process. In this way students can discover what information is missing, they can edit and can come to closure on their pieces. When a piece is finished it can be typed into a booklet format which the author may choose to illustrate with pictures, photographs or diagrams. (The self-portraits written earlier in this unit may also be brought to closure in this same format.)

Once students have mastered the interviewing process, experts from the community may be invited into the classroom to be guest speakers. These speakers may find it useful to bring one or more hands-on items with which to demonstrate or relate his/her expertise. The items may then be used as a focal point for beginning the interview.

Following the interviews, students can discuss the importance of having individuals with diverse areas of expertise in one's community. After several interviews students are to be encouraged to note interrelationships between community members and the need for each member to fulfill his/her role in the community. Students may be asked how a community can operate with missing members. Will it retain the same shape and characteristics when a member leaves? How is a community like an icosahedron?

This unit is extensive in scope. It integrates at least four major curriculum areas -- multicultural study, visual arts, language arts and geometry -- and it involves students, teachers, parents and visiting community members. This unit can easily span a two month period. How does one assess such a unit?

The most reasonable assessment should involve all the participants. This can be accomplished through questionnaire form. Students, teachers, parents and participating community members may be given a list of vocabulary and concepts the unit was aimed at introducing and participants can check those concepts and vocabulary terms they knew before the unit, those they learned through the unit and those they have yet to learn.

An assessment relating to whether students and teachers can now view their class as a community of experts with special relationships might entail providing a list of names of all those in the class community. Participants can then be asked to give at least one area of expertise for each name. If teachers and students are able to do this, it can be supported

that the unit may have been successful in encouraging class community members to take note of some of the positions each member of that community fulfills. The uniqueness of each community member has been stressed.

Student-teacher conferences can be used to further assess what students have learned about community in relation to individuality. Conferences can also be used to discover what each child has learned about him/herself and his/her expertise.

The questions students ask in interviews can be assessed in terms of whether the questions get at the interviewees area of expertise and individuality. And the development of interviewing skills can be assessed when reading the detail students include in their biographical works.

The geometry projects can be assessed through a cross-word puzzle which incorporates geometric concepts and terminology. It can also be assessed through observation of students' later constructions and ability to describe these constructions to other students and teachers.

This unit, when implemented, is likely to educate the teacher as well as the students and parents. After scrambling for a dictionary to look up "icosahedron", parents, teachers and students will be scrambling for information on their expertise and the expertise of others. When any community opens itself to discover the experts and expertise contained within its own sphere or "icosahedron", fascinating discoveries can be made.

(At the end of this unit or school year the all-class icosahedron can be disassembled with a staple remover and the students can take their icosahedron faces home, thus, restoring photos and other personal two-dimensional items to their homes.)

ENDNOTES

[1]"Icosahedron", Webster's New Universal Unabridged Dictionary Deluxe Second Edition, Jean L. McKenzie, ed., (New York: Simon and Schuster, 1979), p. 701.

[2]ibid

[3]"Icosahedron", The Oxford English Dictionary, Volume V, (Oxford: Oxford University Press, 1978), I., p. 14.

[4]ibid

[5]ibid

[6]Norton, Juster. The Phantom Tollbooth, (New York: A Windward Book, Random House, 1961), pp. 172 and 173.

APPENDIX

Dear Parent,

We are beginning a unit called Our Class as an Icosahedral Community in which we will concentrate on discovering and sharing our areas of expertise and bringing experts in their fields from the greater community to share their knowledge with us. As part of this unit we will be featuring a student author each week. We shall interview each student author and shall also apply our interviewing skills to guest experts. We shall be integrating writing, geometry and art into the unit as well.

But, in order to start this new unit we need your help. Next Wednesday and Thursday we will be making an all-class icosahedron. For this project each student will need three to seven photographs or other two-dimensional items which relate personally to the student. Each item should be no larger than 3 x 5 ". The items may include: baby photo, family photo, cards, letters or post cards, school photo, photos of favorite things, etc. The items will be treated with care.

Also within the next three weeks each student will be interviewing a family member or close friend and shall be asking that individual to share information on his/her area of expertise or on one special life experience. The student will use this information to write a short biographical work.

Thank you for your help,